

# *California Energy Commission's Demand Response Protocol - IPMVP Report*

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## **1.0 BACKGROUND**

The California Energy Commission (CEC), through its contractor Xenergy, secured the services of the IPMVP to review a draft Demand Response (DR) protocol. The IPMVP team was charged with

- arranging a wide peer review of the document and
- assessing the practicality of adopting the protocol as part of IPMVP's family of documents.

The activities required to quantify the value in Demand Response programs often involve highly technical calculations requiring professionals skilled in engineering, statistics and accounting. Accordingly the IPMVP sought out experts in energy engineering and M&V to participate in this review. However the quantification and apportionment of value generated by Demand Response activities also often requires common sense judgement regarding what-if scenarios that exist in the real world. Having worked through many of these issues while developing the original IPMVP document, we performed this review with the belief that the most important first step is to create a framework that any sensible person could understand and that can be adapted to meet the needs of many participants and situations.

## **2.0 ROLE OF IPMVP**

The IPMVP has been involved in establishing protocols for the past eight years. In that time we have had the opportunity to experience the joys and frustrations of bringing together disparate groups and forging consensus. Perhaps the most important lesson is that there can be no useful discussion if participants do not share a common vocabulary. In any new field there is necessarily new language

to describe unique situations. However, ultimately there is nothing new under the sun. Participants are highly encouraged to maintain discipline in establishing framework terminology and maintaining a glossary of most-used terms.

The IPMVP is a document, a committee and a concept. The core concept of IPVMP is that parties involved in contracts to reduce energy use should have a common language with which to structure and manage the settlement of those contracts. The IPMVP was designed to allow parties flexibility in designing M&V procedures that make sense for each contract.

## **2.1 ROLE IN DEMAND RESPONSE PROGRAMS**

Over the past few years energy efficiency programs involving instantaneous demand reductions have grown across the country. These programs, which may be offered by Utilities, Independent System Operators (ISOs), or some other organization have more or less the same goals, to manage customer load at peak demand times by signaling participants but each has evolved a slightly different settlement process. To date there has been no effort to standardize the methods of assessing the magnitude of load reductions. The California Energy Commission contracted with Xenergy and the IPMVP to determine the feasibility of creating a protocol of standard methods. The IPMVP agreed to leverage its experience in creating M&V protocols and its access to M&V professionals around the world in two ways

- by expediting review of Xenergy's report and
- by considering adopting the work as part of the IPMVP.

This report summarizes the IPMVP DR team's approach and conclusions and lays out a plan for further activities. The comments are made with the intent of assuring that this study be as useful as possible to a broad national and international audience.

## **2.2 STATE OF THE DEMAND RESPONSE PROGRAMS**

There is little certainty in the current wholesale and retail electric power markets. Several regions (ISOs), states and utilities have DR programs as part of their load management strategies. While there are differences in the supply and demand characteristics of each jurisdiction, the basics of baselining, modeling, forecasting and settling remain the same. The popularity of DR programs may wax and wane, but the basis for quantifying the results will outlast the current chaos in the retail energy industry.

The goal of all DR programs is to manage supply and demand during peak periods. Each jurisdiction develops a program that combines peak generation and demand reduction. Some areas have invested more heavily in peaker plants. Some areas rely on conservation and demand-responsive loads. In both cases there is a need to better understand whether a single set of methods can be adopted to quantify the DR activities.

The settlement of generation relies on direct metering. The settlement of DR is conceptually simple, but practically more difficult to achieve a fair result at an acceptable cost. Each jurisdiction should have the freedom to use a settlement process that best matches its load characteristics and event drivers, i.e. weather.

All DR programs are contracts with terms and conditions for both parties. All quantitative assessments of DR must be considered within the contractual environment, including ease of use, fairness and cost-effectiveness of settlement procedures.

### **3.0 THE REVIEW PROCESS**

The CEC contracted with the IPMVP, through Xenergy, to conduct an industry-wide review of Xenergy's work. The purpose of the review was both to validate the methods employed in the study and to validate the perceived need for a standard. The IPMVP agreed to manage a review of the draft report and deliver a compilation of the comments for use in the final report. Subsequently, the IPMVP decided to invite the IPMVP Technical Committee to review the report as well.

The IPMVP DR team sent out invitations to ~50 people considered expert or actively interested in DR issues. We received 14 responses. The compiled comments of the invited reviewers are provided in a separate document. In addition, the IPMVP Technical Committee (IPMVP-TC) reviewed the document and the invited review comments and provided specific guidance on the feasibility of converting the draft report into a protocol.

This review addresses the comments on the technical content of the Xenergy report separately from comments and suggestions related to the development of an IPMVP-DR protocol. In general, both the invited reviewers and the IPMVP-TC were highly supportive of the quality of the draft report and the findings and recommendations. Our plans initially called for submission of compiled review comments leading to a final report. The final report was to be considered for adoption as an IPMVP document. However, having reviewed the comments, and with additional comments from the IPMVP technical committee, we believe that adoption by IPMVP will require additional effort

### **3.1 OVERVIEW OF REVIEW**

Both the invited reviewers and the IPMVP-TC found the report to be of high quality. It substantially fulfills the CEC's goal of providing a survey of existing techniques and documenting participant reaction to existing DR baseline methods. The substantive issues raised by the reviewers are presented below in two sets. The first are questions that need to be answered in the final report and suggestions for improving the final report. The second set contains recommendations for further research and validation needed prior to creating an IPMVP protocol.

**3.1.1 GENERAL ISSUES**

The document will benefit if the first two sections can be reorganized. Specifically, general overview should be first and detailed review of approaches should be later.

**3.1.2 TECHNICAL**

1. In the event that more than one baseline option is allowed, what are the criteria for selecting one option over another? Was there a weighting of factors that led Xenergy to the conclusion about the best baseline strategies?
2. Did Xenergy use data sets representative of the broad range of load types and conditions found in California?
3. When using weather regression, is it sufficient to select an arbitrary balance point for all buildings? What are the pros and cons of allowing building-specific balance points?
4. The report is bulky and overly technical in its current form. The final report should emphasize the results, conclusions and recommendations and place the technical work in an appendix.

**3.1.3 JURISDICTIONAL**

While the majority of reviewers support a national protocol, several reviewers did not appreciate that their baseline methodologies might change if IPMVP adopted a standard. This is understandable but does not constitute sufficient grounds to deter development. The added efficiency for multi-market participants must be considered as well.

The complete list of compiled comments warrants review, but does not materially alter our conclusion that an IPMVP DR Protocol is worth pursuing.

**3.2 IPMVP TECHNICAL COMMITTEE REVIEW**

As part of the review process, IPMVP also received comments from the IPMVP Technical Committee. A list of committee members is provided at the end of this report in Appendix A. More information about IPMVP Technical Committee can be found at [http://www.ipmvp.org/committees\\_tech.html](http://www.ipmvp.org/committees_tech.html). The IPMVP-TC review was not planned in the original contract, but was added at their (IPMVP-TC) request. The review was specifically aimed at providing guidance on the possibility of converting the Xenergy report into an IPMVP protocol. However some of the comments are relevant to the final report as well.

**3.2.1 IPMVP TECHNICAL COMMITTEE**

During the September 18th conference call, the Technical Committee discussed the invited-reviewer comments. The TC agreed that the DR Draft report constituted a good start, but that additional work would be needed prior to IPMVP adoption. Specifically, the TC determined that a dedicated IPMVP DR subcommittee should conduct a more thorough review of the load forecast models, particularly those developed for ASHRAE.

**3.2.2 NEXANT**

Nexant provided additional comments worthy of consideration prior to IPMVP adoption. Nexant evaluated DR programs for the CEC and came to a similar conclusion as Xenergy as to the (potentially) most appropriate baseline procedures. These comments warrant a complete reading on their own.

### 3.2.3 ASHRAE REPORTS

In reviewing the Xenergy report to comment on the possibility of converting the Xenergy report into an IPMVP protocol, Dr. Haberl from Texas A&M noted specific ASHRAE work that is relevant to the DR effort.

Specifically, ASHRAE has recently completed three research projects - RP1004, RP1093 and RP1050 -

- RP1004 - Methodology Development to Determine the Long-Term Performance of Cool Storage Systems from Short Term Measurements - reviews forecasting loads for thermal storage (i.e., whole-facility loads) and is relevant to the report. The final report and papers on this project are available from ASHRAE.
- RP1093 - Compilation of Diversity Factors and Schedules for Energy and Cooling Load Calculations - developed diversity factor calculations for simulation and forecasting kWh and kW from interval data.
- RP1050 - Development of a Toolkit for Calculating Linear, Change-point Linear, and Multiple Linear Inverse Building Energy Analysis Models

Also of potential interest are the ASHRAE Predictor Shootouts I and II. Other papers and reports are covered in the 1093 literature review.

## 4.0 DEVELOPMENT OF DEMAND RESPONSE PROTOCOL

Based on the comments received from DR reviewers and the response of the IPMVP technical committee we recommend continued effort towards an IPMVP DR protocol.

The original contract between the CEC, Xenergy and IPMVP envisioned a three-step process. Xenergy was to propose a draft protocol for review, including a workshop. Based on feedback from the workshop and reviewers, Xenergy would submit a final protocol to the IPMVP Executive Committee for potential adoption.

The draft report required more resources than originally expected and, coupled with the unexpected addition of the IPMVP Technical Committee review, it is not now clear that CEC/Xenergy will be able to muster the resources to take the project through the final report phase.

Given the strong technical review of the CEC draft report and broad agreement for an IPMVP DR protocol, the IPMVP has a clear opportunity to contribute to the industry by taking this effort to completion. There remains the question of where to find the resources and how to prioritize this effort in comparison to other initiatives. What follows is the IPMVP-DR team's suggested approach.

### 4.1 SUGGESTED APPROACH

Developing a DR protocol would require people with different set of skills and experience in running and evaluating DR programs. As a first step to developing a national protocol, it is proposed that an IPMVP DR subcommittee will be constituted consisting of DR experts that would build on the work already per-

formed by Xenergy. In order to maintain continuity, IPMVP will request the continued involvement of Xenergy in any future work on DR. It is recommended that the following organizations should also be involved when the IPMVP DR subcommittee is formed:

- Different ISOs (California, New York, PJM, Midwest)
- A selection of Utilities from around the country with experience in administering DR programs
- Organizations/individuals representing customers who will participate in the DR programs
- Consultants who have evaluated DR programs over the last few years

IPMVP, Inc. will develop the protocol and will be responsible for updating and maintaining the document. The deadline for completing the work (electronic availability of the DR protocol on the IPMVP web site) will be May 15, 2003. The first step of the DR Subcommittee would be to develop a plan for completing the DR Protocol. The Technical Committee will oversee the work of the DR subcommittee and deliver a protocol per the project schedule. The Executive Committee of the IPMVP will provide final approval for publication.

Based on the feedback received from reviewers and the guidance received from the IPMVP Technical Committee, the IPMVP DR subcommittee is requested to address the following topics among other issues that it may identify:

- Leverage the analysis performed by Xenergy for CEC but try to limit the main protocol document to around 15 pages with supporting technical analyses contained in appendices.
- Prefer methods that provide simplicity, flexibility, and ease of use and at the same time be technically rigorous.
- Test any methods not considered by Xenergy.
- Make sure that datasets that are used for testing various methods should capture the variances that will be encountered by a national DR protocol.

## **4.2 POTENTIAL SPONSORS**

The IPMVP envisions continuing the work done so far on the development of the DR protocol utilizing funds from different users. so far. The funds of the order of \$100,000-\$150,000 will be used to constitute the DR subcommittee, paying for the time of consultants, paying the lead individual/organization responsible for writing the protocol with input from members of the subcommittee, and to cover for IPMVP staff time. Since a national DR protocol can benefit multiple organizations, multiple sponsors should be targeted to fund this initiative. A few potential sponsors of this new initiative are listed below:

- ISOs (CA, NY, PJM, New England, Mid-West, ERCOT)
- Utilities with ongoing DR programs
- National American Energy Standards Board

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## Conclusion

- Department of Energy
- State Energy Organizations (ASSERTI, CEC, NYSERDA)

Furthermore, IPMVP can do more to identify and foster partnerships with other energy-related associations and standards bodies. The DR protocol can be used as a marketing tool to prove that IPMVP can quickly respond to industry needs.

## 5.0 CONCLUSION

The invited review of the draft DR protocol returned a two-part verdict. First, reviews agreed that the report substantiates the need and practicality of a national standard for DR programs. Second, the reviewers raised sufficient substantive concerns and issues to preclude a rapid adoption of the CEC/Xenergy draft. In addition, IPMVP Technical Committee found the CEC/Xenergy draft protocol to be a sound draft from which to create an IPMVP DR protocol. The IPMVP DR team has endeavored to provide the CEC/Xenergy with a useful review and compilation of industry peer comments. We appreciate your cooperation and look forward to future collaboration.

## *Appendix A: IPMVP Technical Committee Members*

- Lynn Coles, R. W. Beck
- John Cowan, Cowan Quality Buildings
- Ellen Franconi, Nexant Inc.
- Jeff Haberl, Texas A & M University
- Karl Hausker, PA Consulting Group
- Maury Hepner, Crothall Asset Management
- Rick Jones, Southern California Edison
- Satish Kumar, Lawrence Berkeley National Laboratory
- Venkat Kumar, Johnson Controls
- Fernando Milanez, Global MVO Brasil Ltda, Brazil
- Demetrios Papathanasiou, International Finance Corporation
- Steven Hauser, Pacific Northwest National Laboratory
- Robert Sauchelli, Environmental Protection Agency
- Steve Schiller, Nexant, Inc.